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ABSTRACT

The Science in Action series is designed to teach practical science concepts to special-needs students. It is intended to develop students' problem-solving skills by teaching them to observe, record, analyze, conclude, and predict. This document contains a student workbook which deals with basic principles of life science. Six separate units include: (1) the five senses; (2) the sense of sight; (3) the sense of hearing; (4) the sense of smell; (5) the sense of taste; and (6) the sense of touch. The units consist of basic introductory information and questions, worksheets, a self-checking quiz, and instructions for experiments. A cumulative test is provided at the end of the workbook, along with a glossary. The teachers guide (which is included) explains how to use the workbook, together with teaching suggestions and enrichment activities for each unit. (TW)

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The Five Senses

Life Science in Action

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The **Five Senses**

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Teacher's Manual

The Five Senses

Nancy Lobb

A Janus Life Science in Action Book

Teacher's Manual written by Winifred Ho Roderman

OVERVIEW

Making Science Relevant

Can reluctant learners be turned on by science? We believe they can—if they are actively involved in their own learning, and if that learning is relevant to them.

We wrote *The Five Senses* for the older adolescent with reading and learning problems. Through hands-on activities and experiments, your poor readers discover basic facts about their external senses. They then apply what they learn to their own real-life experiences.

The Five Senses is a workbook that can give your special-needs students a practical knowledge of how the five senses work. It can also provide your more skillful students with a science foundation they can build on. You can expand the teaching in each unit to fit the skills of those students by adding your own lessons and activities. Or, you can direct students to the more challenging activities suggested at the end of each unit.

Designed for the Slow Learner

We designed *The Five Senses* especially for learning-disabled students. Each lesson is built around one major concept. Concepts are broken down into small, easy-to-handle steps and constantly reinforced to help students retain learning. Lessons are progressive so that students can slowly build skills. And they are short so that students can successfully finish them in a reasonable period of time.

The Five Senses is part of a set of Janus *Life Science in Action* books. (Other sets in the Janus *Science in Action* series are *Physical Science in Action* and *Earth Science in Action*.) This workbook helps your students meet general science and laboratory science requirements. You can use it as a supplement to or as the core of your science program.

OBJECTIVES OF THIS WORKBOOK

The Janus *Science in Action* series is designed to help special-needs students learn basic and practical science concepts that can be applied to daily living. It also helps students develop problem-solving and thinking skills by teaching them to observe, record, analyze, conclude, and predict.

Objectives of *The Five Senses* are:

- The student will learn that the five external senses are sight, hearing, smell, taste, and touch.
- The student will gain a basic understanding of how the sense organs work.
- The student will learn a vocabulary of useful science words that describe the senses and the ways they work.
- The student will gain a better understanding of his or her own body.
- The student will be able to apply his or her learning to everyday situations.

READABILITY

Average reading level for *The Five Senses* is below 2.5, according to the revised Spache Readability Formula. Words that are particularly useful for understanding science concepts are listed as target words under "Teaching the Units" in this manual. They are also listed and defined in the glossary at the end of the workbook. They are set in boldface type whenever they first appear in the text.

We suggest you review the target words in each unit before students work on that unit. Help students pronounce the words. Encourage students to look up definitions in the glossary. Reinforce recognition and comprehension of the words through word games and oral and written vocabulary activities.

HOW TO USE THIS WORKBOOK

The Workbook Format

The Five Senses, as with all *Janus Science in Action* books, is formatted so that your students can easily recognize what to do as they work through the book.

Each unit begins with a one-page unit introduction that prepares students for the teaching that follows. The introduction includes topic questions that focus students on the concepts they will learn as well as a brief vocabulary exercise, "Before You Start."

Each unit is divided into one- or two-page lessons that are followed by an activity or an experiment.

And each unit ends with a short comprehension exercise, "Check Yourself," and a list of additional student activities, "Check These Out," that reinforce or expand the teaching in the unit. The activities are multimodal so that all students can handle at least one of them successfully.

Introducing the Book

You might begin with a class discussion about what the word *sense* means. Pick one of the senses, such as sight, and ask the class to list the kinds of information that the sense gives them and how that information helps them in their everyday living.

Then distribute the workbook. Encourage students to leaf through the pages and to comment on the attractive illustrations. Tell students about some of the interesting experiments they will be conducting.

Next, read the introduction out loud. Ask students to guess what the five senses are.

Introducing the Unit

Read the unit introduction out loud. Discuss the topic questions and ask students to guess answers to those questions. (At the end of the unit, you might ask students to again answer those topic questions so they can see how much they have learned.)

Then have students do "Before You Start." In this exercise, students are asked to use the glossary to define two or three target words. Words chosen are those students need to know in order to understand the concepts taught in the unit. So, make sure students understand the words before they begin reading the unit.

Teaching Suggestions

Help Your Students Succeed

Keep in mind that many special-needs students have difficulty learning when they work alone. Those students require constant repetition and reinforcement. Therefore, we suggest you keep students paced together as they work through the book.

Have students read each lesson out loud. Encourage discussion to make sure students understand concepts. Whenever possible, have students relate what they learn to their own real-life experiences.

Walk your students through exercises and activities whose formats are not familiar to them. Students should then be able to work independently on those pages where similar exercises or activities appear.

Teaching the Experiments and Activities

Have all materials ready for your students before they come to class. And set the materials up so they can be easily handled and distributed.

We strongly urge that you closely supervise and guide your students through the experiments and activities. Lead your students through each step. Discuss their findings and help them arrive at correct conclusions.

For those students who need a great deal of supervision, we suggest you conduct the experiments or activities while they follow along with their workbooks. More skillful students can work in twos or in small groups.

Be Prepared!

We can't stress enough how important it is to be organized and prepared.

Read each unit before you assign it. Students who become really turned on by your teaching may surprise you with the depth of their questions. A bibliography at the end of this manual lists some books that can quickly give you a general knowledge of the five senses.

Have ready a variety of bonus activities that students with different skills can handle. Students who finish a lesson quickly can work on a bonus activity while they wait for others to catch up.

Gather materials you'll need for the experiments and activities before you start students on a unit. Do the experiments and activities yourself ahead of time so you'll know what should happen and what might go awry. You may need to adjust some of the experiments and activities to fit the skills of your students.

End-of-the-Book Exercises

When students finish *The Five Senses*, have them do the comprehensive exercises under "Show What You Learned." "What's the Answer?" is a brief exercise that tests comprehension of the major concepts taught in the book. "What's the Word?" tests knowledge of some target words.

About the Glossary

The glossary, at the end of the book, lists and defines all target words that appear in boldface type in the text.

Words are listed in alphabetical order and divided into syllables. Definitions given for the words are purposely narrow to help special-needs students understand specific concepts taught in the workbook.

TEACHING THE UNITS

Unit 1: The Five Senses

Target Words: *brain, connected, information, nerve cells, nerves, sense organs, sensitive*

This unit introduces your students to the five external senses: *sight, hearing, smell, taste, and touch*. It also prepares them for the more detailed information they will learn as they work through the book.

PAGE 5: Getting the Facts

Students learn that the brain controls all bodily functions, and that it does so after receiving information from the senses. Generally, the senses work in these ways: Nerve cells (sometimes called *receptor cells*) respond to specific stimuli. They then send messages along a nerve to the brain. The brain interprets the messages and sends messages of its own that control the actions of the body.

PAGE 6: Our Sense Organs

The nerve cells for each of the five senses are located in body parts called sense organs. **Answers to puzzle:** *Across* 2. ear (hearing) 3. nose (smell) *Down* 1. tongue (taste) 2. eye (sight) 4. skin (touch)

PAGE 7: Use Your Senses!

This activity asks students to use each of the five senses to gather information about a common item—a soft drink. If you wish, you can substitute another item for the drink, but it should be one that uses all five senses.

At the end of the activity, lead students in a discussion about their conclusions. Ask them questions such as: *Did you like the drink? Would you want to drink more? Why or why not? Which of your five senses helped you decide?*

PAGE 8: Check Yourself

1. The *brain* controls everything we do. 2. The brain gets *information* from our senses. 3. *Nerves* carry messages to the brain. 4. The skin is sensitive to *touch*. 5. Nerve cells in the nose send messages about *smells*. 6. Nerve cells in the tongue send messages about *tastes*. 7. Nerve cells in the ear send messages about *sounds*. 8. The eye is the *sense organ* for sight.

Enrichment Activities

- Have the class discuss how a computer is like the brain. Invite a computer programmer to speak to the class.
- Have students play a video game. Ask students which of their senses they use to play the game.
- Show students films on the nervous system.

Unit 2: The Sense of Sight

Target Words: *enters, eyelid, focus, image, iris, lens, light rays, optic nerve, pupil, retina*

In the unit introduction on page 9, the eye is compared to a camera. Point out the similarities of their parts: Both have lenses that focus an image, both have openings through which light rays enter, both have light-sensitive surfaces upon which an image is imprinted. Stress that the eye is superior to the camera. Ask students why.

PAGE 10: The Outside of the Eye

Students look at their eyes in a mirror and find the iris, pupil, and eyelid—the parts that control the amount of light entering the eyeball. They then label those parts on a diagram on the page.

This lesson discusses only those three parts of the outer eye. You may wish to discuss other parts and their functions. For example: the cornea, which provides a protective covering for the eye; the tear glands, which provide a liquid that cleanses the eye; eyelashes, which help keep dust from entering the eye.

A bonus activity for students might be to draw one of their eyes, then label and write a brief description of the function of the eye's external parts.

PAGE 11: Experiment 1—What happens to the eye in dim and bright light?

Materials: *hand mirrors, flashlights*

You might have your students work in pairs for this experiment since it is sometimes difficult to see one's own pupils in a mirror. If students work alone, make sure they sit in a dim area, such as a corner, away from windows or overhead lights that can be reflected from their eyes or from the mirror.

Make sure students understand that the pupil becomes larger to let more light into the eye and smaller to keep extra light out.

Observations: 1. When the light is dim, the pupils are big. 2. When the light is bright, the pupils are small.

Conclusions: 1. When light is *dim*, not enough light can enter the eye. The pupils become *big*. 2. When light is *bright*, too much light can enter the eye. The pupils become *small*.

PAGE 12: Inside the Eye

Images travel to the eye in the form of light rays that are reflected from an object. Light rays enter the eye and pass through the lens, which focuses the light rays on the retina. The image is imprinted on the retina, and impulses are sent to the brain.

Point out similarities in a camera: The lens focuses light rays on film, which can be compared to the retina.

PAGE 13: How the Sense of Sight Works

1. When we look at a thing, a picture of that thing travels to our eyes. That picture travels in the form of *light rays*. 2. The light rays enter the eye through the *pupil*. The light rays pass through the *lens*. It focuses the light rays. 3. The focused light rays touch thousands of nerve

cells on the *retina*. An image is formed. Those nerve cells send messages about the image along the *optic nerve*. 4. The messages go to *brain*. It puts the many messages together, and we see.

PAGES 14–15: Experiment 2—What kind of image is formed on the retina?

Materials: a magnifying glass with a handle, a small lamp (without a shade), a box larger than the lamp, an illustration large enough to completely cover the opening of the box, a blank sheet of white paper, adhesive tape, an art knife or sharp pair of scissors

We suggest you and the class together construct the materials for this experiment. For the illustration, draw a large letter with a definite top and bottom (such as A) on a large sheet of white paper.

When students first hold the white paper in front of the magnifying glass, a fuzzy image may appear on the paper. That image will become focused, as the paper is moved closer to or farther away from the magnifying glass, to show an upside-down version of the illustration taped to the box. Make sure students understand that the image traveled from the illustration in the form of light rays and that the magnifying glass focused the light rays on the paper, much as the lens of the eye does on the retina.

Observations: You should see an upside-down picture on the paper.

Conclusions: 1. The paper is like the retina. 2. An upside-down image is formed on the retina. 3. We don't see things upside down because our brain turns the images around in our mind.

PAGES 16–17: How do two eyes help you see better?

Materials: A pen and its cap

In this experiment students learn that two eyes help us judge distance.

Observations: It is easier to put the cap on the pen with both eyes open. It is harder to put the cap on the pen with one eye closed.

Conclusions: 1. It is harder to put the cap on with one eye closed because you don't know exactly how far away the pen is. 2. When both eyes are open, you can see where the pen is. 3. Two eyes help you know how far away something is. 4. Accept any appropriate answer.

PAGE 18: Check Yourself

Answers to puzzle: Across 2. retina 3. focus 5. pupil 8. light rays Down 1. iris 4. upside down 6. lens 7. brain

Enrichment Activities

- If your school is near a butcher shop, purchase cow's eyes. Give students one-edged razor blades and show them how to dissect the eyes.

- Show students examples of optical illusions. Discuss what an optical illusion is and how the brain gets tricked.
- Make a flip book to demonstrate early film-making.
- Make a movie. Soak an old reel of film in bleach. Then give students permanent-ink marking pens. Have them draw simple animated figures on the bleached frames of the film. (Look in your local library for how-to books that give detailed instructions.)

Unit 3: The Sense of Hearing

Target Words: auditory nerve, sound waves, stimulate, vibrates, vibration

This unit teaches how the ear works. Some of your students may be hearing impaired and may feel self-conscious or inferior. Be aware of those feelings. Point out to students that everyone has different degrees of sensitivity in each of the five senses. Thus, even people with "normal" hearing can't hear sounds that others can.

You might use this unit (and unit 2) to help students become aware of the needs of the handicapped.

PAGE 20: Why We Hear

All sounds begin as vibrations. An object vibrates, and its vibrations travel through the air as sound waves. They enter the ear (the sense organ for sound), and we hear.

Students are asked to make sounds by vibrating a taut rubber band. Musical instruments that make sounds in a similar way might be: guitar, banjo, ukulele, fiddle, violin, piano.

PAGE 21: Vibrating Things

Students learn that a vibrating object causes an object that touches it to also vibrate. In the activity, vibrations from the radio cause the glass to vibrate.

PAGE 22: How the Sense of Hearing Works

1. Sound waves enter through a hole in the *outer ear*.
2. Sound waves hit the *eardrum* in the middle ear. That part vibrates.
3. The vibrating eardrum makes three small *bones* vibrate.
4. The vibrating bones make parts in the *inner ear* vibrate. Nerve cells are stimulated.
5. The nerve cells send a message along the *auditory nerve*. The message goes to the brain, and you hear a sound.

PAGE 23: What Next?

1. The eardrum vibrates first.
2. The three small bones vibrate next.
3. Then the parts in the inner ear vibrate.
4. The nerve cells send the message along the auditory nerve to the brain.

PAGE 24: What Do You Hear?

This activity focuses students on their own hearing. Accept all appropriate answers.

PAGE 25: What's Going On?

Students work in pairs or small groups in this activity. They discover how much information they can get from sounds.

PAGE 26: Check Yourself

1. (To make a sound, something vibrates) c. and causes sound waves. 2. (Sound waves travel from) b. the vibrating thing to the ear. 3. (When sound waves enter the ear,) a. they make parts in the ear vibrate. 4. (Vibrations in the inner ear) f. stimulate nerve cells. 5. (Nerve cells in the inner ear send a) d. message along the auditory nerve. 6. (The message goes) e. to the brain, and a sound is heard.

Enrichment Activities

- Invite a speaker from a school for the deaf to talk about techniques deaf people use to receive information.
- Have students suggest ways they could help a mainstreamed deaf student adapt successfully to the class.

Unit 4: The Sense of Smell

Target Words: *molecules, nostrils, odor, olfactory nerves*

This unit briefly describes why people are able to smell odors. Point out that people's sensitivities to smells vary.

PAGE 28: Smells Tell about Things

Students are asked to find out all they can about an object from its odors. Good objects to smell are wrapped foods made up of many ingredients, such as candy bars.

PAGE 29: How the Sense of Smell Works

1. We breathe air through each *nostril*. The air carries molecules from a thing that has an odor. 2. The air and the molecules go into the nose. They touch *nerve cells* at the back of the nose. 3. The nerve cells send a message along the *olfactory nerves*. The message goes to the brain, and we smell the odor.

PAGES 30–31: Experiment 4—What happens when you smell an odor for a while?

Materials: *a strong smelling substance, such as perfume and fruits, a watch with a second hand*

Students learn that they stop smelling an odor even though an object continues to send out odors. (They will smell the odor again if they "rest" their noses by moving away from the object for a few minutes.)

Observations: After three minutes, you smell the odor less or you don't smell it at all.

Conclusions: 1. b. After a while, you stop smelling the odor that's coming to your nose. 2. Student's opinion

PAGE 32: Check Yourself

Answers to puzzle: Across 2. odor 5. nose 6. nostril Down 1. brain 2. olfactory 3. molecules 4. stop

Enrichment Activities

- Gather a variety of objects students are familiar with. Blindfold students and ask them to identify the objects from their odors.
- Arrange a field trip to a place that makes bath soaps, hand lotions, cosmetics, shampoos, or perfumes. Students can learn how scents are added to such products.

Unit 5: The Sense of Taste

Target Words: *dissolve, flavor, papillae, saliva, taste buds*

In this unit students learn that the sense of taste is closely related to that of smell. As with smell, sensitivity of this sense varies from person to person.

PAGE 34: Tasting Food

The taste buds on the tongue are the receptor cells for taste. Like smell nerve cells, the taste buds are stimulated by chemicals. Foods must be dissolved before we can taste them. Saliva in our mouths dissolves foods and helps us taste them.

PAGE 35: Four Tastes

Four kinds of taste seem to stimulate taste buds: salt, sour, sweet, and bitter. Certain areas of the tongue seem to be sensitive to each kind of taste. **Answers to activity:** 1. bitter (Back) 2. sweet (Tip) 3. sour (Sides) 4. salty (Front sides)

PAGE 36: Can You Smell It?

Students learn that foods are flavorsome to us because we smell as well as taste them.

PAGE 37: Can You Taste It?

This activity shows students that smells contribute to the taste of foods. The foods must feel alike, so choose those with similar textures and cut them up into pieces of the same size.

PAGE 38: Check Yourself

1. (The sense organ for taste) a. is the tongue. 2. (The top of the tongue is) c. covered with bumps called papillae. 3. (You can taste only things that) d. are dissolved in water or saliva. 4. (Your taste buds are sensitive to) b. sweet, sour, salty, and bitter tastes. 5. (Each part of your tongue is sensitive) f. to a certain taste. 6. (Most foods taste the way they do) e. because of the way they smell.

Enrichment Activities

- Arrange a field trip to a place that prepares and packages convenience foods.
- With the class, plan a menu for a class lunch or picnic. Then prepare the meal together.
- Some people hold jobs as "tasters" for food industries. Invite one of those tasters to speak to the class.

Unit 6: The Sense of Touch

Target Words: *Braille, pressure, reflex, sensation*

Students learn about the last of the five external senses discussed in the workbook—the sense of touch.

PAGE 40: Our Sensitive Skin

The skin is the sense organ for touch. Nerve cells (nerve endings) in the skin send messages to the brain when something touches the skin. However, the nerve cells stop sending messages shortly after contact. That's why we stop feeling the weight or textures of our clothing. It's a good thing touch nerve cells stop sending messages because unabated sensations (for example, of the pressure of our clothing) would become unbearable.

PAGE 41: Different Kinds of Nerve Cells

Touch nerve cells are sensitive to different stimuli, such as pressure, light touch, heat, cold, and pain. Each nerve cell sends only one kind of message. The different kinds of nerve cells are distributed all over the skin.

In this activity, students, working in pairs, find different kinds of nerve cells on the hand. Students mark the locations of those nerve cells on the drawing. Guide your students through this activity, step by step.

PAGES 42–43: Experiment 5—Which part of the body is more sensitive?

Materials: *a hairpin*

In this experiment, students use a hairpin to find out if the arm or the fingertip is more sensitive to touch.

They touch the ends of the hairpin to the skin and note how many points they feel. Each time they feel two points, they bring the ends closer together. They stop when they feel one point. The ends will be closest together on skin that has the most nerve endings and that is, therefore, the more sensitive.

Observations: The ends are closer together on the fingertip.

Conclusions: 1. The skin on the fingertip has more nerve cells than the skin on the arm. 2. The fingertip is more sensitive than the arm.

PAGE 44: Danger!

Nerve cells that give pain sensations help keep the body safe by warning of harm. They also trigger unconditioned reflex actions that quickly take the body away from danger. Unlike other touch sensations, pain sensations don't cease but continue to be felt as long as the nerve cells are stimulated.

If we didn't have nerve cells that are sensitive to pain, we wouldn't know when we are ill or wounded. Thus, those nerve cells help us stay healthy and alive.

PAGE 45: Check Yourself

Answers to puzzle: Across 5. sensation
6. reflex 8. heat 9. cold Down 1. pressure
2. pain 3. danger 4. skin 7. light touch

Enrichment Activities

- Give students blindfolds and modeling clay. Ask them to imagine a simple shape, such as a triangle, and to form that shape with the clay.
- Arrange field trips to museum or botanical exhibits for the blind.

Show What You Learned

PAGE 46: What's the Answer?

1. Sight—Eye; Hearing—Ear; Smell—Nose; Taste—Tongue; Touch—Skin 2. Generally, nerve cells in the sense organ are stimulated when they come into contact with stimuli from outside objects. The nerve cells send messages along a nerve to the brain. 3. Accept all appropriate answers. Examples might be: *Sight—We see a fire; Hearing—We hear a car coming toward us; etc.*

PAGE 46: What's the Word?

1. Brain 2. Sense Organs 3. Nerve Cells
4. Nerves 5. Sensation 6. Stimulate

TEACHING AIDS

Resources

- Check out museums in your area for special science exhibits. Contact the science departments of nearby colleges and universities for leads on materials, speakers, and exhibits.
- Videotapes or transcripts of science programs shown on both public and network television are often available to schools. Contact the public relations or education office of those stations for information.

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Introduction

Suppose someone gives you a bag of chips. You take a chip and eat it. What will you do if the chip tastes good? What will you do if the chip tastes bad?

If the chip tastes good, you'll probably eat more. If it tastes bad, you'll probably stop eating. You may even throw the bag of chips away.

Whatever you do depends on what your sense of taste tells you.

Taste is one of the senses that our bodies use to find out about the world around us. We call those senses *the five senses*.

The five senses gather facts for our bodies. They tell us what's happening around us. They tell us about the things around us. They help us stay alive and well.

Imagine what it would be like if we didn't have the five senses. We wouldn't know what things look, smell, and taste like. We wouldn't know what things sound and feel like. We wouldn't know when we are in danger. Or when something happens that can make us happy.

This book will help you learn about the five senses. You'll learn what they are and how they work. You'll do interesting science activities and experiments.

And you'll find out what the senses in *your* body can do.



Unit 1

The Five Senses

What do you know about potato chips? You may know what they look, smell, and feel like. And you may know how they sound and taste when you bite into them.

If you know any of those things, it's because you've learned about potato chips. You've learned about them through your senses.

We call the senses that we learn through *the five senses*. Everything that you know, you've learned through some or all of those senses. You're using some of them right now to learn about the five senses!

- What are the five senses?
- How do the five senses work?

You'll find out in this unit.

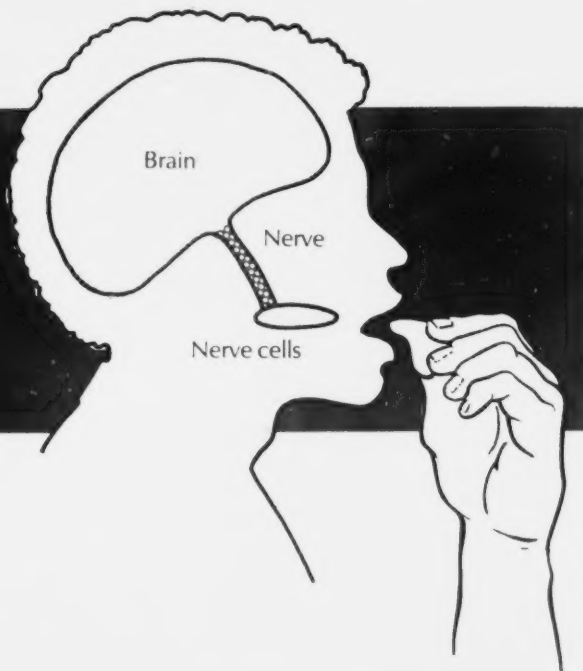
Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary that's at the back of this book. On the lines below, write what the words mean.

1. **connected** _____

2. **information** _____

3. **sensitive** _____



Getting the Facts

There's a part of your body that controls everything you do. For example, it makes you eat something. It makes you like or not like what you are eating. It makes you eat more or stop eating.

What is that part of your body?

That part of your body is your **brain**.

You act in many different ways. How you act depends on information your brain gets about everything around you. How does your brain get that information?

Right! Your brain gets information through your senses.

Here's how your senses work:

Your body has parts in it called **nerves**. Nerves are connected to the brain. At the ends of the nerves are parts called **nerve cells**. Nerve cells are sensitive to certain things. For example, some of your nerve cells are sensitive to how things taste.

Nerve cells get information about things such as taste. They pass that information along the nerves to the brain.

Our bodies have many senses. But the senses people usually talk about are the five senses. Do you know what the five senses are? If you do, write them here.

Our Sense Organs

The five senses are: *hearing, sight, smell, taste, and touch.*

You learned that nerve cells send messages about each of the five senses. Those nerve cells are found in certain parts of the body. Those parts are called **sense organs**.

Each sense organ sends only one kind of message. For example, one sense organ sends only messages about what things look like. But another sends only messages about how things taste.

What is the sense organ for each of the five senses? Look at the pictures on the next page. Fill in the puzzle. Then check your answers. The right answers are upside down at the bottom of the page.

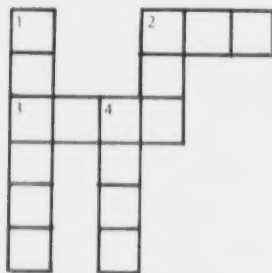


Across

2. The sense organ for hearing
3. The sense organ for smell

Down

1. The sense organ for taste
2. The sense organ for sight
4. The sense organ for touch



Answers: touch—skin
taste—tongue
smell—nose
sight—eye
hearing—ear

Use Your Senses!

What can your senses tell you about a soft drink? Pour a soft drink into a glass. *Listen* to the sounds the drink makes. Then *look*, *smell*, *taste*, and *touch* the drink. Write what you hear, see, smell, taste, and feel.

The five senses



1. Hearing



2. Sight



3. Smell



4. Taste



5. Touch

Check Yourself

Show what you learned in this unit. Finish these sentences. The words you'll need are listed below. One word will be left over.

brain	five	information
nerves	sense organ	smells
sounds	tastes	touch

1. The _____ controls everything we do.
 2. The brain gets _____ from our senses.
 3. _____ carry messages to the brain.
 4. The skin is sensitive to _____.
 5. Nerve cells in the nose send messages about _____.
 6. Nerve cells on the tongue send messages about _____.
 7. Nerve cells in the ear send messages about _____.
 8. The eye is the _____ for sight.
-

Check These Out

1. You use your five senses even when you're asleep. How do you use each sense when you're sleeping? Find out.
2. Some people do not have all of the five senses. For example, a person who is blind does not have the sense of sight. But that person learns to use some other sense to make up for the missing sense. So a blind person may have a very sharp sense of hearing, or a very sensitive sense of touch. Find out how a deaf person can make up for the missing sense of hearing.
3. Alcohol and other drugs can cause the senses to not work right. Find out what happens to the senses when a person uses alcohol or drugs.
4. As you work through this book, you may want to find out more about the five senses. You can find out more by looking in an encyclopedia or by getting books about the five senses from a library. You can also talk to an expert, such as a doctor or a science teacher.

Here are some things you may want to find out:

 - What is the nervous system? How does it work?
 - What are the external senses? What are the internal senses?
 - At what age does a person get each of the five senses?
 - What is the "sixth sense"? How is that sense different from the five senses?



Unit 2

The Sense of Sight

Your eye is like a very good camera. It can take pictures that are still or moving, in color or in black and white. It can take close-up pictures of a tiny thing. It can take wide pictures of many huge things.

But look at the pictures a real camera takes. And think of the pictures your eye sees. The pictures your eye sees are so much better than those a camera takes! No camera has yet been made that's better than the eye.

- How does the eye work?
- How does the sense of sight work?

You'll find out in this unit.

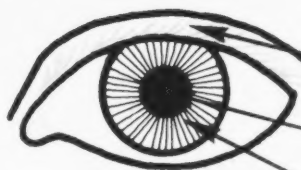
Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary. On the lines below, write what the words mean.

1. enters _____

2. focus _____

3. image _____



1. This is the _____.

2. This is the _____.

3. This is the _____.

The Outside of the Eye

As you read this, your eyes are taking pictures of words. Close your eyes a little, and keep on reading. What happens?

Right! You can't see the words very well. When you close your eyes, you keep some light out of your eyes.

In order for you to see, light must enter your eyes. But just the right amount of light must enter. So the outside of each eye has a part that lets the right amount of light in.

Get a mirror and look at your eyes. Look at the iris in each eye. The iris is the big, colored circle in the eye. What color is your iris?

Now look at the smaller, dark circle in the middle of each iris. That smaller circle is called the **pupil**. The pupil is really a hole in the iris. Light enters the eye through that hole.

The iris is a muscle. It can make the pupil bigger or smaller. It does that to control the amount of light that enters the eye.

One other part controls the amount of light that enters the eye. It does that by covering the eye. What is that part?

Yes! That part is the eyelid. The eyelid can be lowered to keep out light. It can be raised high to let in more light.

Look at the picture of the eye on this page. It shows the three parts you just learned about. Write *iris*, *pupil*, and *eyelid* next to each part.

Experiment 1

What happens to the eye in dim and bright light?

Materials (What you need)



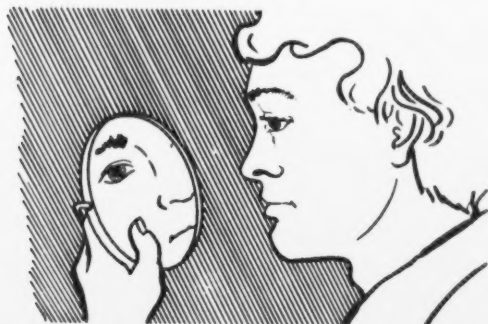
A small mirror



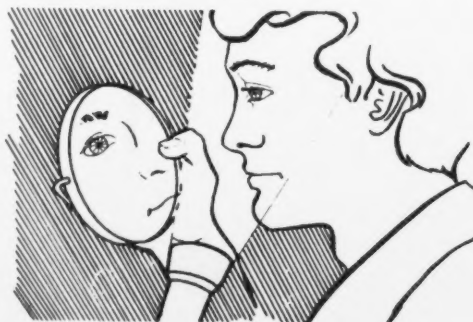
A flashlight

Procedure (What you do)

1. Sit in a place where the light is dim. Look into the mirror at your eyes. Are the pupils big or small?



2. Shine the flashlight on your face. The light near your eyes is now bright. Are the pupils big or small?



Observations (What you see)

1. When the light is dim, are the pupils big or small?

2. When the light is bright, are the pupils big or small?

Conclusions (What you learn)

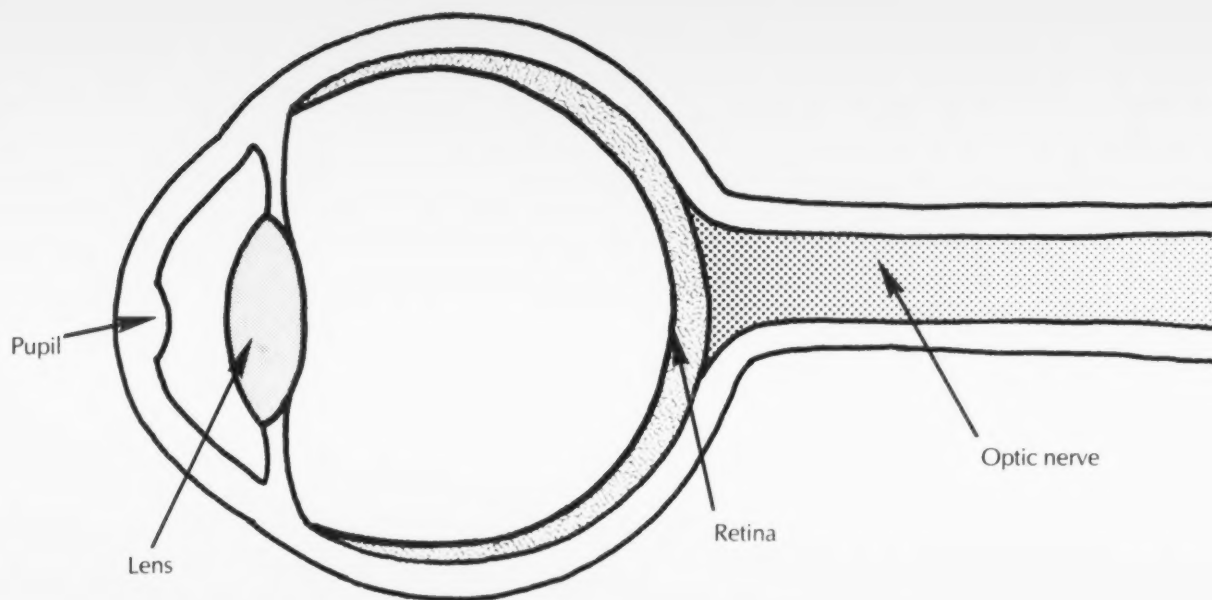
Finish these sentences. Write *bright*, *dim*, *big*, and *small*.

1. When light is _____,
not enough light can enter the eye. The pupils become

_____.

2. When light is _____,
too much light can enter the eye. The pupils become

_____.



Inside the Eye

When we look at a thing, a picture of that thing travels to our eyes. It travels as **light rays**. The light rays then enter our eyes.

What do light rays enter the eye through?

Right! Light rays enter through the pupil.

The light rays next pass through a part called the **lens**. The lens helps you see things clearly. If things are far away, the lens becomes thinner. If things are close, the lens becomes thicker. That's why you can see things close up and far away.

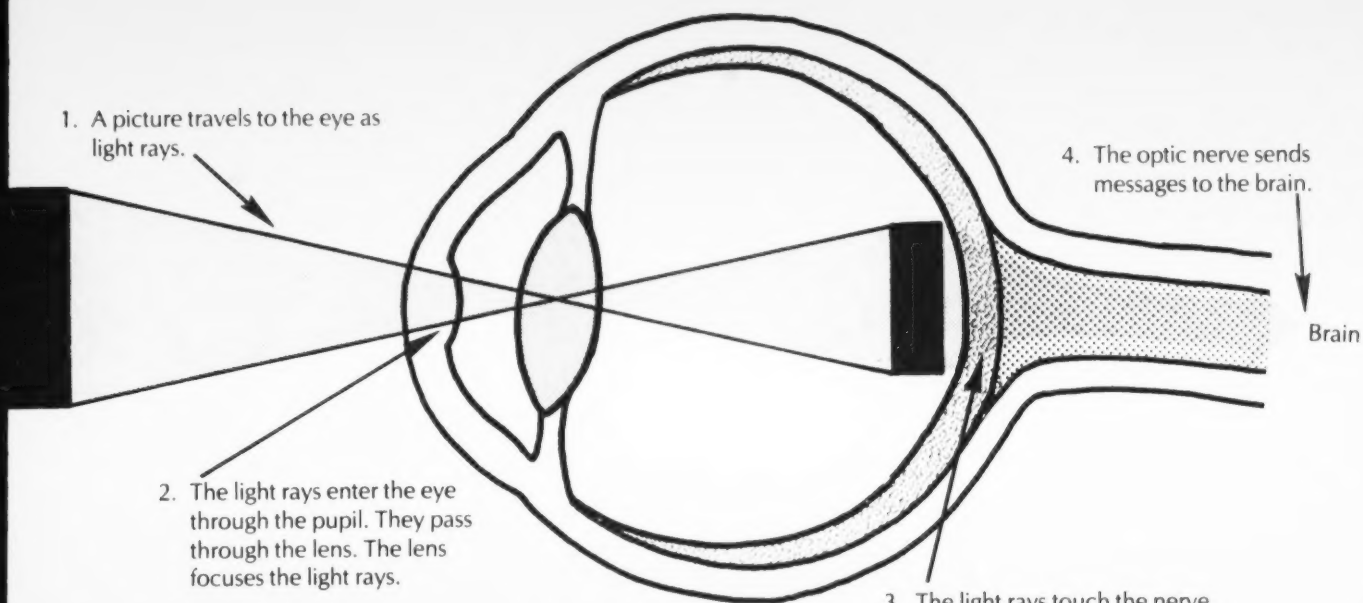
The lens also does this: It sends the light rays to the back of the eyeball. It focuses (gathers together) the light on a part at the back of the eyeball. That part is called the **retina**.

The retina has thousands of tiny nerve cells. Some of those nerve cells are sensitive to different colors. Some are sensitive to different brightnesses of light.

When light rays touch those nerve cells, an image (a picture) forms on the retina.

Each nerve cell sends its message along a nerve called the **optic nerve**. Where do you think the optic nerve carries those messages?

Yes! The optic nerve carries the messages to the brain. The brain puts the messages together to make a picture that we see.



How the Sense of Sight Works

The diagram on this page shows how we see. Read the sentences on the diagram. They describe what happens inside the eye when we look at a thing. Then finish the sentences below.

1. When we look at a thing, a picture of that thing travels to our eyes. That picture travels in the form of

2. The light rays enter the eye through the

The light rays pass through the _____
It focuses the light rays.

3. The focused light rays touch thousands of nerve cells on the

_____.

An image is formed. Those nerve cells send messages about the image along the

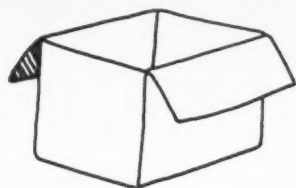
4. The messages go to the _____.

It puts the many messages together, and we see.

Experiment 2

What kind of image is formed on the retina?

Materials



A cardboard box



A magnifying glass



A piece of white paper



A knife
(or pair of scissors)



Tape



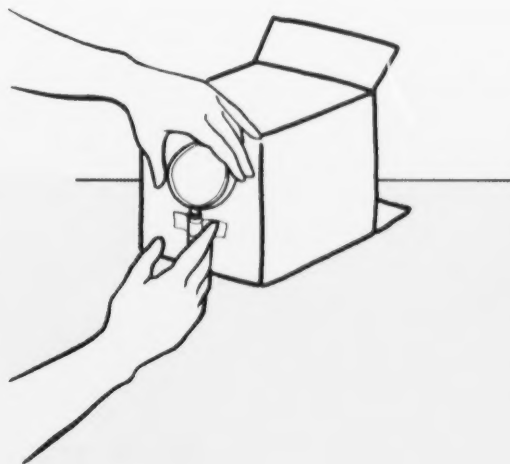
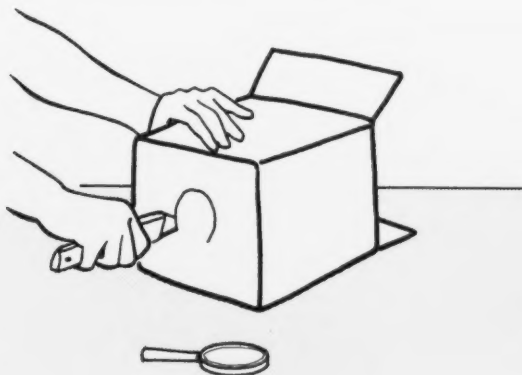
A small lamp



A large picture
(on white paper)

Procedure

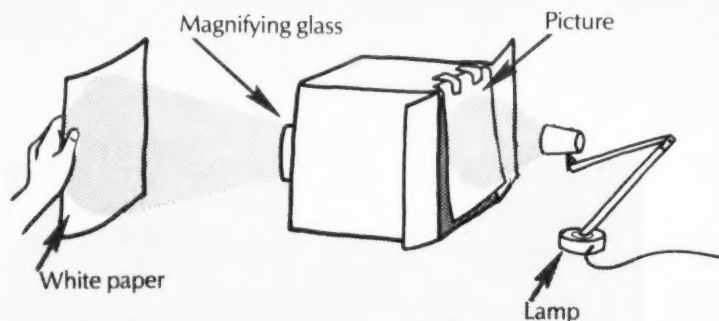
1. Cut a hole in the bottom of the box.
Make the hole a little smaller than the magnifying glass.
2. Tape the magnifying glass over the hole.



3. Hold the picture so it faces the open end of the box. Tape the picture over that end. Put the lamp next to the back of the picture. Turn the lamp on.



4. Turn off all the lights in the room. Hold the paper in front of the magnifying glass. Slowly move the paper away from the box. What do you see on the paper?



Observations

What do you see on the white paper?

You should see an upside-down picture on the paper. That picture is the same as the one you taped on the box.

Conclusions

1. The hole in the box, the magnifying glass, and the paper are like parts in your eye. The hole is like the pupil. The magnifying glass is like the lens. What is the paper like?

Right! The paper is like the retina.

2. What kind of image is formed on the retina?

-
3. Why don't we see things upside down?
-

Experiment 3

How do two eyes help you see better?

A camera takes pictures. Your eyes take pictures too.

But a camera takes one picture at a time. You have two eyes. So your eyes take two pictures at a time. Your brain puts those two pictures together.

Because you have two eyes, you see better than if you only had one. How? Do this experiment and find out.

Materials



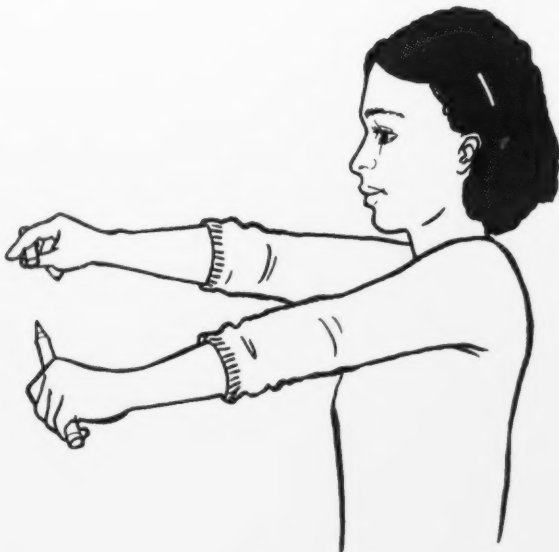
A pen



The cap for the pen

Procedure

1. Hold the pen in one hand. Hold it straight out in front of you. Hold the cap in your other hand.
2. Close one eye. Keep your arms straight. Put the cap on the pen. Is it easy to do?



3. Now take the cap off the pen. Keep both eyes open. Put the cap on the pen again. Is it easier to do this time?



Observations

When is it easier to put the cap on—with one eye closed, or with both eyes open?

Conclusions

1. Why is it harder to put the cap on with one eye closed?

Right. It's harder because you don't know exactly how far away the pen is.

2. Why is it easier to put the cap on with both eyes open?

-
3. How do two eyes help you see better?

Two eyes help you know how far away something is.

4. Two eyes help you do things, such as step down from a high place to a lower place. Write another example like that.

Two eyes help _____

Check Yourself

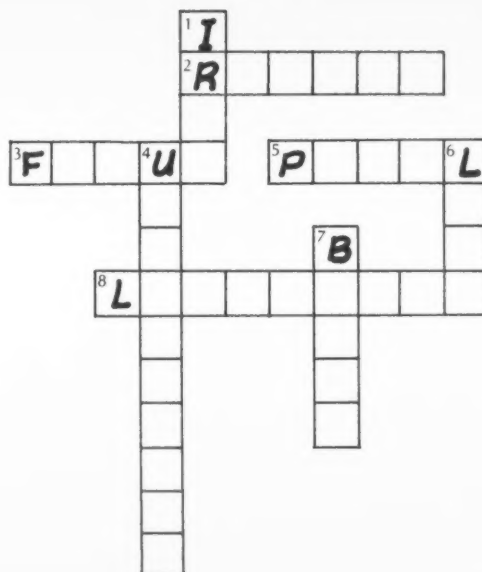
Use words from this unit to do the crossword puzzle. The clues below will help you. In the puzzle, each word is started for you.

Across

2. Light rays form an image on the _____.
3. The lens can _____ light rays on the back of the eye.
5. The _____ becomes larger in dim light and smaller in bright light.
8. Pictures come into the eye in the form of _____.

Down

1. The _____ lets just the right amount of light into the eye.
4. The image inside the eye is _____.
6. The _____ helps us see things near and far away.
7. The _____ makes the image look right-side up.



Check These Out

1. Find out how a camera takes a picture. Then make a poster that shows a camera and an eye. On one half of the poster, show how a camera takes a picture. On the other half, show how an eye takes a picture.
2. How well can you see? When was the last time you had your eyes checked? Invite your school nurse or an eye doctor to your class. Have that person bring an *eye chart*. Use the eye chart to check how well you can see.
3. To have good sight, you must take care of your eyes. Find out how to take care of your eyes. Then make a list of what to do and what not to do. Put up your list in class.
4. Here are more things you may want to find out:
 - You learned about three parts in the front of the eye. What are the other parts in the front of the eye? What do those parts do?
 - Many people have nearsightedness, farsightedness, or astigmatism. What are they? What has to be done to the eye to fix each one?
 - How do we see color? What is color blindness?
 - What's your dominant eye?
 - Who is Stevie Wonder? What does he do?



Unit 3

The Sense of Hearing

Close your eyes for a minute. What do you hear? Do you hear people talking? Do you hear things moving?

Every second of the day, our ears hear things. They hear soft sounds as well as loud sounds.

Our sense of hearing helps us find out what's going on around us.

- How do we hear things?
- How does the sense of hearing work?

You'll find out in this unit.

Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary. On the lines below, write what the words mean.

1. **auditory nerve** _____

2. **stimulate** _____

3. **vibration** _____



Why We Hear

In unit 1, you learned what the sense organ for hearing is. What is that sense organ?

Right! The sense organ for hearing is the ear. Nerve cells deep inside the ear are sensitive to sounds that things make.

Here's how a thing makes a sound:

- The thing **vibrates**—it moves back and forth very quickly.
- Its vibrations cause vibrations in the air. The vibrations in the air are called **sound waves**.
- The sound waves travel to your ear.
- The sound waves enter your ear, and you hear the sound.

You can see how something vibrates and makes a sound. Do this:

Get a rubber band. Stretch it between two fingers. Pull it and let it go. You'll see it vibrate, and you'll hear the sound it makes.

Some things make music the way a rubber band makes a sound. Name some of those things that make music.

Vibrating Things

You learned that when a thing vibrates, it moves back and forth quickly. Suppose that vibrating thing is touching a second thing. What do you think the second thing will do?

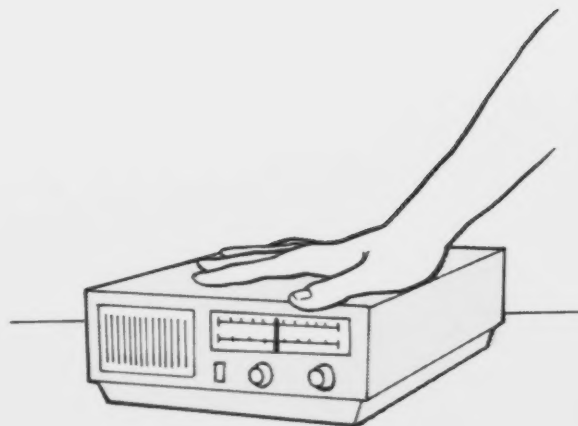
Yes, the second thing will also vibrate.

You can see for yourself how a vibrating thing makes another thing vibrate. You'll need a radio and a small plastic glass with a little water in it. Get those things and follow the directions below.

1

Turn on the radio. Turn it up loud. Put your hand on the radio. What do you feel?

You feel the radio vibrate.

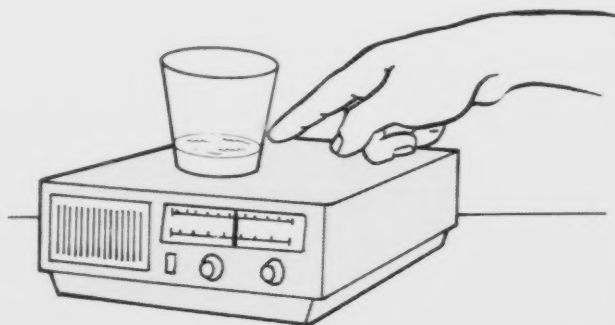


2

Now put the glass of water on top of the radio. Watch the water. What does it do?

The water moves. It moves because the glass vibrates.

What makes the glass vibrate?



How the Sense of Hearing Works

Let's say you're listening to a band. The music makes vibrations in the air—sound waves. Those sound waves travel to your ear.

Look at the diagram on the next page. It shows what happens when sound waves reach the ear.

The sentences below tell what happens to the sound waves. But some words are missing. The missing words are the names of parts of the ear. You can find those names on the diagram.

Find the names and use them to finish the sentences.

1. Sound waves enter through a hole in the

2. Sound waves hit the _____ in the middle ear. That part vibrates.

3. The vibrating eardrum makes three small

_____ vibrate.

4. The vibrating bones make parts in the

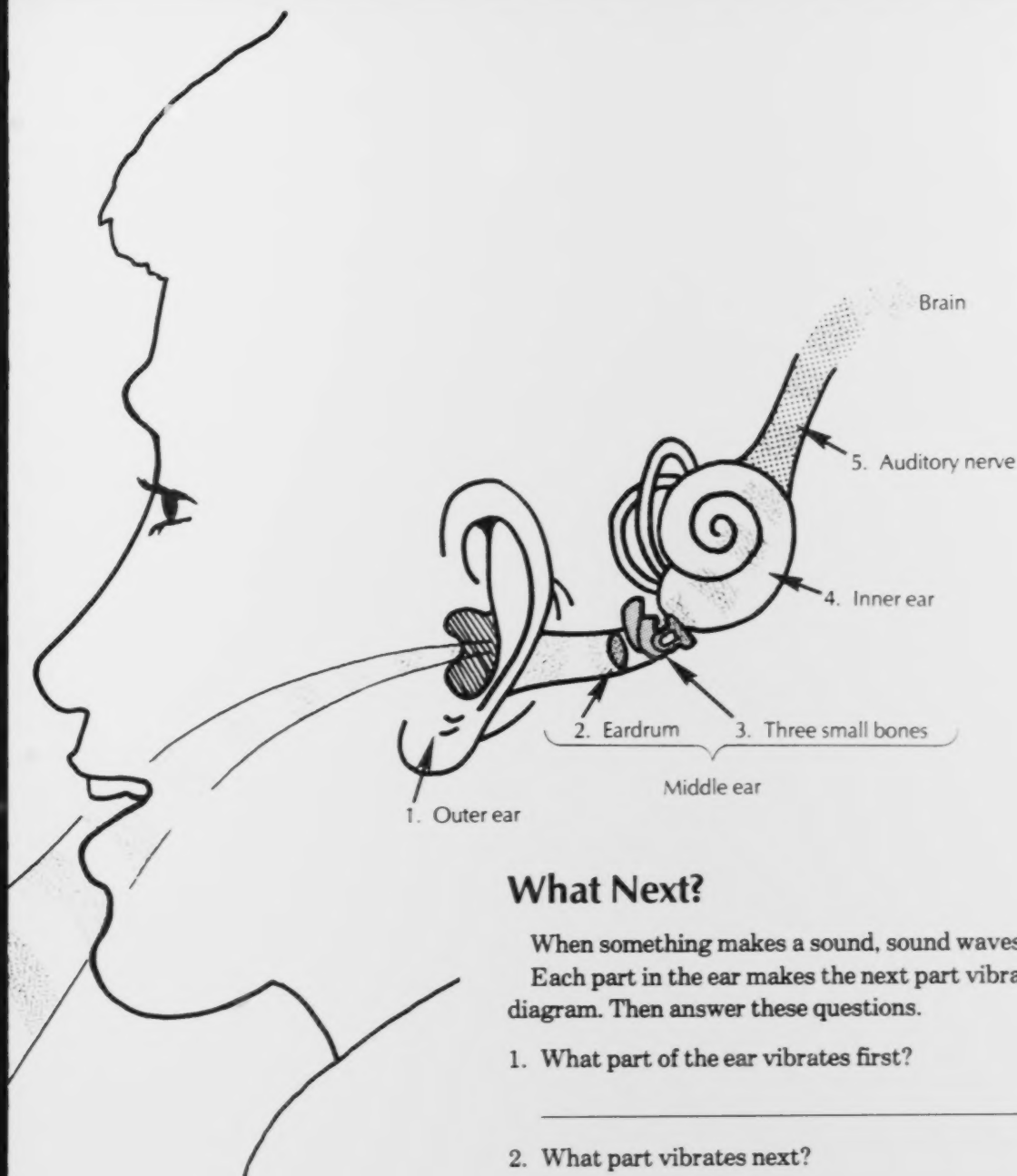
_____ vibrate. Nerve cells are stimulated.

5. The nerve cells send a message along the

_____.

The message goes to the brain, and you hear a sound.





What Next?

When something makes a sound, sound waves enter the ear. Each part in the ear makes the next part vibrate. Look at the diagram. Then answer these questions.

1. What part of the ear vibrates first?

2. What part vibrates next?

3. Then what part vibrates?

4. The vibrations stimulate nerve cells. What do the nerve cells do?

The nerve cells send the message along the auditory nerve. That message goes to the brain. And a sound is heard.

What Do You Hear?

Our sense of hearing lets us hear many different sounds. We hear loud sounds and soft sounds. We hear sounds that are close and sounds that are far away. We hear sounds that people make and sounds that things make.

Find out what sounds you can hear right now. Sit next to an open door or window. Cover your eyes with your hand so that you can see only this page. Then listen carefully and answer these questions.

1. What is the loudest sound you hear?

2. What is the softest sound you hear?

3. What is the closest sound you hear?

4. What is the farthest sound you hear?

5. Do you hear someone talking? If you do, what is that person saying? Where is that person?

6. Do you hear cars and trucks passing by? If you do, are they going fast or slow?

7. Do you hear a machine being used. If you do, where is it? What is it?

8. Do you hear any sounds that tell you about the weather? If you do, what are they?





What's Going On?

You use your sense of hearing to find out what's going on around you. Sometimes you use it to find out what another person is doing. Try it. You'll need a partner to do the things below. Don't look at your partner. Guess what your partner is doing from the sounds you hear.

1

Your partner will use a book to make a sound. (Examples: Drop the book on the floor; turn the pages; slam the book shut; etc.) What does your partner do with the book?

2

Your partner will choose three different things in the room. Your partner will use them to make sounds. What three things is your partner using?

3

Your partner will talk to you from somewhere in the room. In what part of the room is your partner?

4

Your partner will stand about four feet away from you. Then your partner will walk toward or away from you. Which way is your partner walking?

Your sense of hearing helps you find out many things. It helps you find out what someone is doing. And it helps you find out what's making a sound. It also helps you find out where someone is. So, when you want to know what's going on, you can use your sense of hearing.

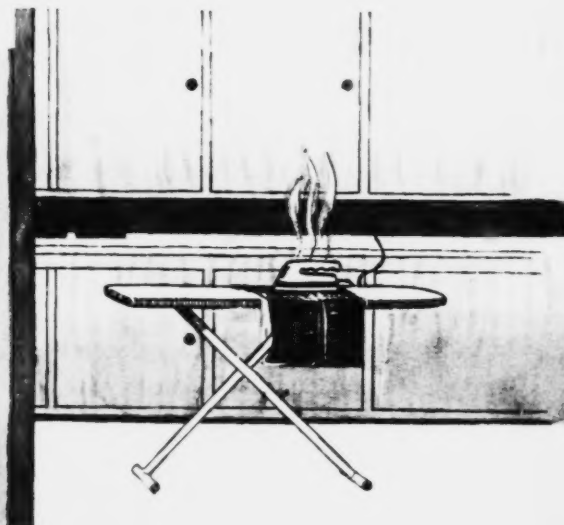
Check Yourself

Show what you learned in this unit. Finish these sentences.
Draw a line from the words on the left to the correct words on the right.

- | | |
|--|--|
| 1. To make a sound, something vibrates | a. they make parts in the ear vibrate. |
| 2. Sound waves travel from | b. the vibrating thing to the ear. |
| 3. When sound waves enter the ear, | c. and causes sound waves. |
| 4. Vibrations in the inner ear | d. message along the auditory nerve. |
| 5. Nerve cells in the inner ear send a | e. to the brain, and a sound is heard. |
| 6. The message goes | f. stimulate nerve cells. |

Check These Out

1. A person who is born without a sense of hearing has a hard time learning to talk. Find out why.
2. Some deaf people use sign language to "talk" with other people. Find a book about sign language in a library. Learn some of the signs.
3. Some deaf people learn to "read" other people's lips. Try it yourself. Watch a TV show, but turn off the sound. See if you can understand what the people in the show are saying.
4. Try to find a show by the National Theater of the Deaf on TV. Or find a show where someone "signs" the words for deaf people who are watching. Tell the class about the shows you find.
5. Here are more things you may want to find out:
 - Who was Helen Keller? Who was Annie Sullivan? Find out about their lives.
 - How does a hearing aid work?
 - What are some dos and don'ts for taking care of your ears?
 - How do your ears help you keep your balance?



Unit 4

The Sense of Smell

Suppose you're ironing a shirt in the kitchen. You leave the kitchen to answer the phone. While you're on the phone, you notice a bad smell coming from the kitchen. That smell tells you this: You forgot to take the iron off the shirt, and the shirt is starting to burn!

We learn a lot about our world through smells. Smells help us know what's happening. And they help us know about the things around us.

- Why do we smell things?
- How does our sense of smell work?

You'll find out in this unit.

Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary. On the lines below, write what the words mean.

1. molecules _____

2. nostrils _____

3. olfactory nerves _____

Smells Tell about Things

Imagine this: It's dinnertime. You come home and smell something cooking. The smell tells you that someone is frying chicken. The smell also tells you that the chicken is almost ready to eat.

You're using your sense of smell to tell you what you're having for dinner and when you'll be eating.

Most foods and many other things have an **odor**—a smell. We have a sense organ that is sensitive to odors. What is that sense organ?

Right! That sense organ is the nose.

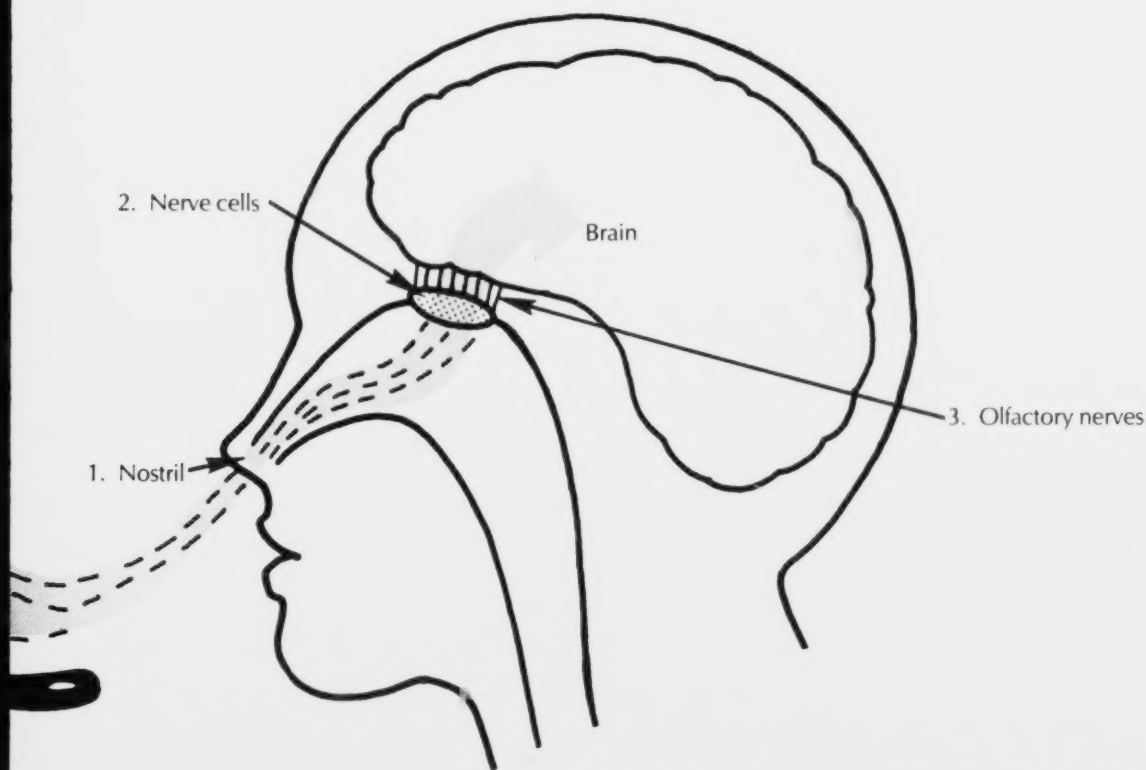
You learned that light rays travel to the eye, and that sound waves travel to the ear. That's why we see and hear. Something like that happens with the nose too.

We smell because certain things travel to the nose. Those things are molecules. Molecules are very tiny pieces of a thing.

When a thing has an odor, molecules break away from that thing. The molecules float in the air. We breathe the air, and the molecules go into the nose. Then we smell the odor of the thing.

Look around you. Choose something that has several odors (for example, a sandwich or a plant with flowers). Smell that thing. Then write what you learned about the thing from the way it smells.





How the Sense of Smell Works

You learned that odors travel through the air to the nose. What happens when an odor reaches the nose? Look at the diagram. It shows the parts of the nose we use to smell.

The sentences below tell what happens when we smell an odor. But some words are missing. The missing words are the names of parts of the nose. You can find those names on the diagram. Write the names where they belong in the sentences.

1. We breathe air through each

The air carries molecules from a thing that has an odor.

2. The air and the molecules go into the nose. They touch

at the back of the nose.

3. The nerve cells send a message along the

The message goes to the brain, and we smell the odor.

Experiment 4

What happens when you smell an odor for a while?

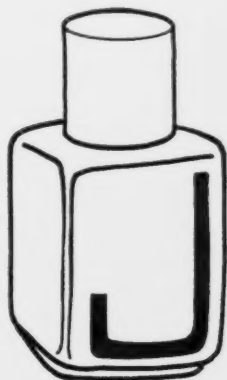
Suppose you go to a hot-dog place. You have to wait in line for a long time.

You watch the hot dogs cooking on a grill. You hear the sound the hot dogs make as they cook. And you smell the hot dogs.

Finally, it's your turn to get your hot dog. You can still see the hot dogs cooking. You can still hear them cooking. What about the odor of the hot dogs? Do you think you can still smell it?

You see a thing for as long as the light rays come to your eyes. You hear a thing for as long as the sound waves come to your ears. Do you smell a thing for as long as the odor comes to your nose? Do this experiment and find out.

Materials



Something that has a strong odor
(such as aftershave or perfume)



A watch
(with a second hand)

Procedure

1. Hold the strong-smelling thing near your nose.
2. Smell the thing for three minutes. Use the watch to time yourself.



Observations

When you start, you smell the odor a lot. After three minutes, what do you smell?

- _____ 1. You smell the odor more.
- _____ 2. You smell the odor less.
- _____ 3. You don't smell the odor at all.

After three minutes, you smell the odor less. Or you don't smell it at all.

Conclusions

1. What happens after you smell an odor for a while?
 - _____ a. You keep smelling the odor for as long as it comes to your nose.
 - _____ b. After a while, you stop smelling the odor that's coming to your nose.
2. Do you think it's a good thing or a bad thing that you stop smelling an odor after a while? Why?

Check Yourself

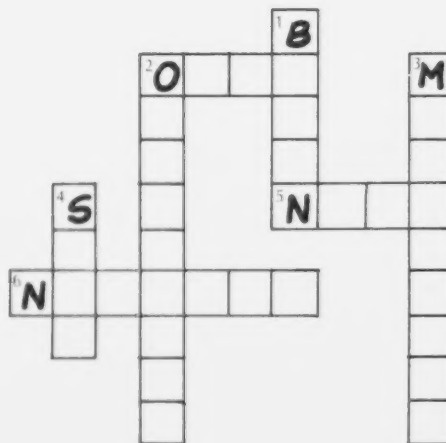
Use words from this unit to do the crossword puzzle. The clues below will help you. In the puzzle, each word is started for you.

Across

2. Another word for *smell* is _____.
5. Our sense organ for smell is the _____.
6. We breathe air through each _____.

Down

1. When you smell an odor, a message goes to the _____.
2. Nerve cells send a message to the _____ nerves.
3. Odors are carried in the air by _____.
4. You _____ smelling an odor after a while.



Check These Out

1. In some jobs, people are paid to use their sense of smell. Find out about some of those jobs.
2. Your sense of smell can tell you that you're in danger. Make a list of smells that may mean danger is near.
3. Some people can smell things that other people can't smell. Get a partner. Find out which things each of you can smell.
4. Everybody has some favorite odors. Make a list of your favorite odors. Tell why you like each one.
5. Here are more things you may want to find out:
 - How do animals use their sense of smell?
 - What is an insect's sense organ for smell? How does an insect use its sense of smell?
 - You know that you stop smelling an odor after a while. What happens if you smell a thing for a while, then take it away from your nose, and then put it back near your nose again?



Unit 5

The Sense of Taste

What are your favorite foods? Do you like hamburger? Fish? Chicken? Noodles? Watermelon?

One reason you like certain foods is that they taste good to you. Your sense of taste helps you know which foods you want to eat or don't want to eat. It helps you decide if a food is good or not good. It helps you decide if you want to eat more or stop eating.

- Why do we taste things?
- How does our sense of taste work?
- What kinds of things can we taste?

You'll find out in this unit.

Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary. On the lines below, write what the words mean.

1. **dissolve** _____

2. **flavor** _____

3. **saliva** _____

Tasting Food

What is your sense organ for taste?

Right! Your sense organ for taste is your tongue. Your tongue is covered with nerve cells that are sensitive to tastes. Those nerve cells are called **taste buds**.

Get a mirror and look at your tongue. What is on the top of your tongue?

The top of your tongue is covered with many little bumps called **papillae**. Your taste buds are in the papillae.

When you eat a food, your taste buds send different messages about that food to your brain. Your brain puts all the messages together. Then the food tastes a certain way to you.

But something has to happen to the food before it can stimulate the taste buds. Find out what has to happen. Get a piece of hard cracker (or some other dry food, such as a sugar cube). Get a clean paper towel too.

Dry your tongue with the towel. Put the cracker (or sugar cube) on your tongue. Keep your tongue out of your mouth. Can you taste the food?

☐ Yes ☐ No

Pull your tongue, with the food on it, into your mouth. Close your mouth and let the food become wet. Now can you taste the food?

☐ Yes ☐ No

You don't taste food when it is dry. You taste it when it becomes wet. That's because your taste buds are stimulated only by things that are dissolved in a liquid.

How does your saliva help you taste foods?



Four Tastes

Did you know this? Your taste buds probably are sensitive to only four tastes. Those tastes are *sweet*, *sour*, *bitter*, and *salty*. That's all!

Taste buds on different parts of your tongue are sensitive to those four tastes. For example, taste buds on the back of your tongue are sensitive to bitter tastes. And taste buds on the front sides of your tongue are sensitive to salty tastes.

You can find out which parts of your tongue are sensitive to sweet tastes and to sour tastes. You'll need something sweet, such as hard candy. And you'll need something sour, such as a slice of lemon.

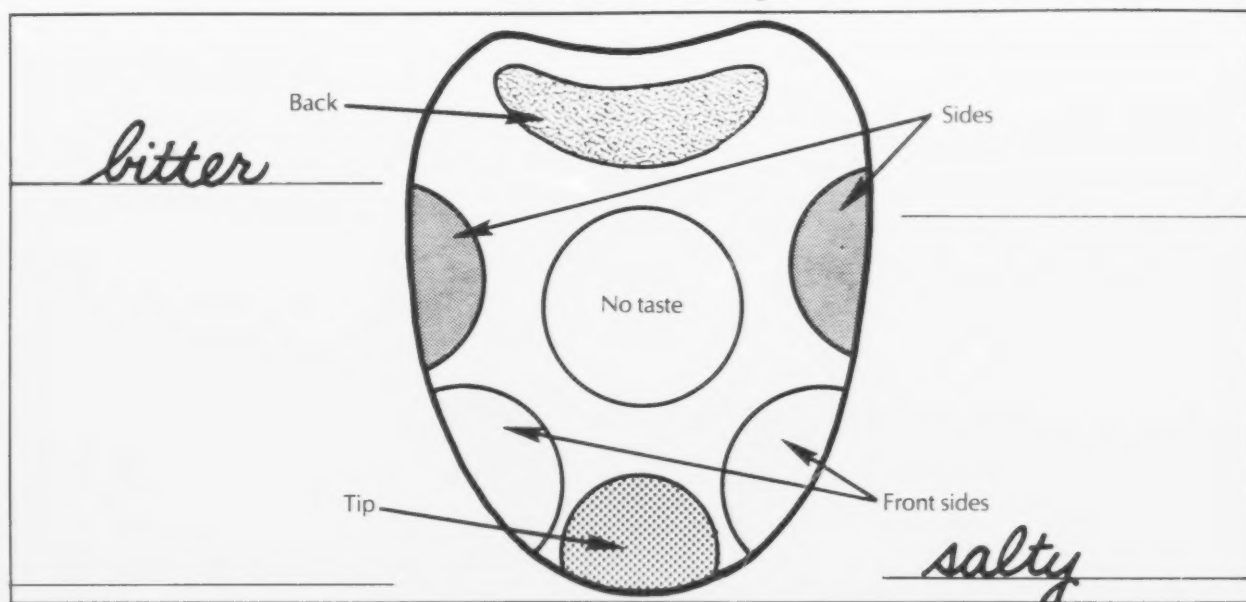
1

Dip the candy into water to get it wet. Put the candy on the tip of your tongue. Now touch it to the two sides of your tongue. Where does it taste sweetest? Write *sweet* next to the picture where it belongs.

2

Now put the lemon on the tip of your tongue. Then touch it to the two sides. Where does it taste more sour? Write *sour* where it belongs.

The taste areas on the tongue



What Happens?

Which part of the tongue is sensitive to sweet tastes?

Yes! The tip of the tongue.

Which part of the tongue is sensitive to *sour* tastes?

Right! The sides of the tongue.

Can You Smell It?

Let's say you have a cold. And you can't smell things. You eat a hamburger. How does the hamburger taste?

The hamburger probably doesn't taste like anything when you have a cold. That's because food doesn't have flavor when you can't smell it.

You learned that taste buds are probably sensitive to just four tastes: sweet, sour, bitter, and salty. But we think foods have more than those four tastes because of our sense of smell.

Think about the way hamburgers taste. Hamburgers have a certain flavor, don't they? They don't taste like other food, such as chicken.

Here's why you think hamburgers taste the way they do:

When you chew a hamburger, some of it dissolves in your mouth. Your taste buds send messages to the brain about how sweet, sour, bitter, or salty the hamburger is.

But at the same time, your nose smells the odors of the hamburger. It sends messages about those odors to the brain. The brain puts together the messages from your taste buds and your nose. And you think the hamburger tastes like a hamburger!

Not all foods taste the way they do because of your sense of smell. But most foods do, like hamburgers. List some foods that taste good to you because of their odors.



Can You Taste It?

How much does your sense of smell help you taste things? Find out. You'll need a partner. You'll also need small pieces of three different foods (apple, celery, onion, carrot, and so on).



1

Close your eyes so that you can't see the foods. (Or put a blindfold over your eyes.)

Hold your nose.

Your partner now puts a piece of each food in your mouth, one piece at a time. Taste each food and tell your partner what you think the food is. Your partner then writes down what the food is and what your guess is.

Food

Guess

_____	_____
_____	_____
_____	_____

2

Now have your partner give you the foods to taste again. But this time don't hold your nose. (Keep your eyes closed.)

Food

Guess

_____	_____
_____	_____
_____	_____

What Happens?

When you *don't* smell, how many foods do you guess correctly?

When you *do* smell, how many foods do you guess correctly?

Check Yourself

Show what you learned in this unit. Finish these sentences.
Draw a line from the words on the left to the correct words on the right.

- | | |
|--|---|
| 1. The sense organ for taste | a. is the tongue. |
| 2. The top of the tongue is | b. sweet, sour, salty, and bitter tastes. |
| 3. You can taste only things that | c. covered with bumps called papillae. |
| 4. Your taste buds are sensitive to | d. are dissolved in water or saliva. |
| 5. Each part of your tongue is sensitive | e. because of the way they smell. |
| 6. Most foods taste the way they do | f. to a certain taste. |

Check These Out

1. Find pictures of foods that are sweet, sour, salty, and bitter.
Make a poster out of those pictures. Label each food to show its strongest taste.
2. Have a "Tasting Day." Each person brings in a food that other people may not have tasted. It can be a family's favorite food or a food from another country.
3. What are food seasonings? Why do people use seasonings?
Bring in some different kinds of seasonings.
4. Here are some things you may want to find out:
 - What does a taste bud look like?
 - What happens to dissolved food so that we can taste it?
 - What different shapes do papillae have? Do all papillae have the same number of taste buds?
 - The tongue senses other things besides tastes. It senses hot and cold. Why does a cold drink taste different from a warm drink?



Unit 6

The Sense of Touch

Close your eyes. Have a friend put something in your hand. Feel that thing. Even without seeing it, you can probably tell what that thing is just by touching it.

You learn a lot about your world through your sense of touch. Your sense of touch tells you if a thing is hot or cold. It tells you how heavy a thing is and whether that thing is smooth, hard, or sharp. It helps you find out how a thing is shaped. It helps you know what a thing is.

- How does our sense of touch work?
- How do we use our sense of touch?

You'll find out in this unit.

Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary. On the lines below, write what the words mean.

1. **pressure** _____

2. **reflex** _____

3. **sensation** _____

Our Sensitive Skin

You have a sense organ that completely covers your body. That organ tells you if something presses hard on you. It tells you if something as light as an ant touches you. It tells you how hot or cold things are and if those things hurt you.

What is that sense organ?

Right! That sense organ is your skin.

The skin is our sense organ for touch. It is so sensitive that blind people use it to read books. They do that by feeling special letters with their fingertips. (That way of reading is called Braille.)

The skin has millions of nerve cells that are sensitive to different kinds of touch. When something touches the skin, those nerve cells send their different touch messages to the brain. The brain tells us what we are feeling. We call each kind of feeling a sensation.

Think about the sensations you felt when you first put on your clothes today. Did your clothes feel heavy? Tight? Scratchy?

What sensations are you feeling right now?
What do your clothes feel like?

You probably don't feel your clothes at all. That's because most of the skin's nerve cells stop sending touch messages after a while.

Why is it a good thing that these nerve cells stop sending touch messages after a while?



Different Kinds of Nerve Cells

The nerve cells in the skin are sensitive to *light touch*, *pressure*, *heat*, *cold*, and *pain*. But each nerve cell sends only one kind of touch message.

You can see that by making a map of the sensations that the hand feels. You'll need a partner. You'll also need:

- 5 coloring pencils (black, yellow, red, blue, and green);
- a pin in a dish of hot water;
- a pin on an ice cube; and
- a pencil with a dull point.

Directions

Ask your partner to close his or her eyes and to tell you when he or she feels a sensation.

1. **Heat**—Use the pin that is in hot water. Press the head of that pin gently all over your partner's hand. On the picture, draw black dots to show where your partner feels heat.
2. **Light touch**—Very gently, touch the point of the pencil all over your partner's hand. On the picture, draw yellow dots to show where your partner feels light touch.
3. **Pressure**—Press the point of the pencil a little harder on your partner's hand. Draw red dots on the picture.
4. **Cold**—Use the pin that is on the ice cube. Press the head of that pin gently on your partner's hand. Draw blue dots on the picture.
5. **Pain**—Gently press the point of the pin on your partner's hand. Do not press hard enough to break the skin. Draw green dots on the picture.

A map of touch sensations

(Color the circles. The first is done.)

-  Heat (black)
-  Light touch (yellow)
-  Pressure (red)
-  Cold (blue)
-  Pain (green)



Experiment 5

Which part of the body is more sensitive?

Some parts of the body are more sensitive to light touch than other parts are. The skin on those sensitive parts has more nerve cells. And the nerve cells are closer together. So those sensitive parts feel more light touch sensations.

You can see that for yourself in this experiment. You'll need a partner.

Materials



Procedure

1. Hold your hand, palm up, in front of you. Close your eyes.
2. Your partner holds the hairpin so that the ends are about 1/2 inch apart. Your partner lightly touches your fingertip with the two ends. You should feel two things touching you.



3. Your partner brings the ends of the hairpin closer together and touches your fingertips again. Your partner keeps doing that until you feel only one thing touching you. Open your eyes when you feel that. Look at the hairpin. How close together are the ends?



4. Close your eyes again. Your partner touches you in the same ways on your arm. Open your eyes when you feel only one thing. How close together are the hairpin ends?



Observations

Where are the hairpin ends closer together when you open your eyes—on your arm, or on your fingertip?

The hairpin ends are closer together on your fingertip. They are farther apart on your arm.

Conclusions

1. Your fingertip can feel two things when they are very close together. But your arms can't. Why is that?

Right! The skin on your fingertip has more nerve cells than the skin on your arm.

2. Which part of the body is more sensitive—the fingertip, or the arm?
-



Danger!

Suppose you're near a fire. Your skin feels how hot the fire is. So you stay far away from the fire, where you won't be burned. Your sense of touch keeps you safe.

But suppose you touch something very hot by accident. What does your body do?

The part of your body that touches the hot thing feels pain. That pain warns the body to do something fast. You quickly move away from the hot thing before it can hurt you any more.

In fact, you quickly move even *before* a message goes to your brain. That's because your body has a way of quickly acting when nerve cells feel certain kinds of pain. That quick action is called a **reflex**.

What is another example of a reflex?

Here's another way pain keeps us safe: Let's say you have a toothache. You go to a dentist. The dentist discovers an infected tooth. She treats the tooth, and the pain goes away.

A pain such as a toothache is a sign that something is wrong with the body. It can be a sign that we are sick. What would happen if we *didn't* have nerve cells that are sensitive to pain?

Check Yourself

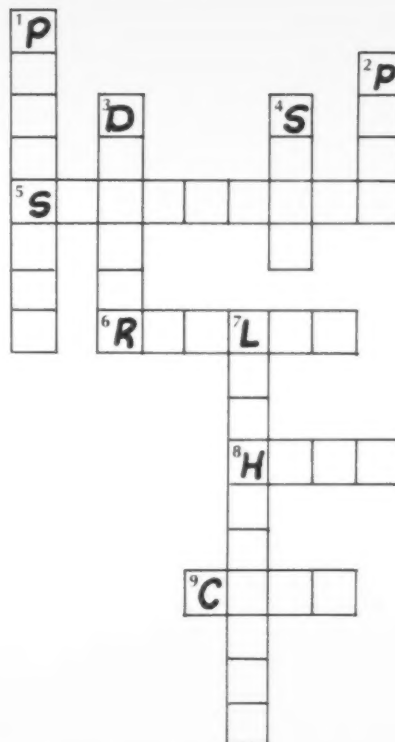
Use words from this unit to finish the crossword puzzle. The clues below will help you. In the puzzle, each word is started for you.

Across

5. A feeling
6. A quick action
8. What some nerve cells feel when you're in the sun
9. What some nerve cells feel when you touch ice

Down

1. What some nerve cells feel when something presses hard
2. What tells you something is wrong
3. What nerve cells keep you from
4. The sense organ for touch
7. What some nerve cells feel when an ant touches you



Check These Out

1. You know that blind people read by using Braille. Find out more about Braille. Get a Braille book and see what the letters are like.
2. Some people can tell what things are just by touching them. Get six different things. Choose a partner. See if your partner can guess what each thing is just by touching it.
3. Make a "touch picture." On poster paper, paste things that are big and small, rough and smooth.
4. Try doing some things using *just* your sense of touch. For example, try eating a meal, finding your way across a room, or finding a certain book.
5. To play some sports and games, people need to use their sense of touch. Find out more about those sports and games.
6. Here are more things you may want to find out:
 - What are the layers of the skin? What does each layer do?
 - What are the most sensitive parts of the body?
 - The skin is covered with fine hairs. What do those hairs have to do with the sense of touch?
 - What do the nerve cells in the skin look like?

Show What You Learned

What's the Answer?

1. Draw a line from each sense to its sense organ.
One is done.

Sight	Tongue
Hearing	Nose
Smell	Eye
Taste	Skin
Touch	Ear

2. Choose one of the sense organs. Tell how that sense organ gets information and sends it to the brain.

3. Write examples of how our senses keep us safe.

Sight:

Hearing:

Smell:

Taste:

Touch:

What's the Word?

Write the correct words for the meanings.

1. Part of the body that controls everything the body does

B

2. Parts of the body that get facts about the world

S

 O

3. Parts of the body that are sensitive to sight, sound, smell, taste, and touch

N

 C

4. Parts of the body that take messages from the sense organs to the brain

N

5. A kind of feeling

S

6. Make something act or work

S

Congratulations!

You've learned a lot about the five senses. You've learned:

- what each of the five senses are;
- how each sense works;
- what your senses do; and
- many other science facts about the five senses.

Glossary

au di to ry nerve: nerve that carries sound messages to the brain

Braille: a way blind people read

brain: part of the body that controls everything the body does

con nect ed: joined together

dis solve: melt in a liquid

ear drum: a very thin piece of skin between the outer ear and the middle ear

enter: go into something

eyelid: skin that closes over the eye

five sen ses: sight, hearing, smell, taste, and touch

fla vor: a taste

fo cus: gather together

hear ing: the sense that tells us about sounds

im age: a picture

in for ma tion: facts about a thing

i ris: the colored circle in the eye

lens: part of the eye that gathers light rays and helps us see things near and far away

mol e cules: very tiny pieces of a thing

nerve cells: parts of the body that get sights, sounds, smells, tastes, and touches

nerves: parts of the body that carry messages to the brain

nos trils: the two holes in the nose

o dor: a smell

ol fac to ry nerve: nerve that carries smell messages to the brain

op tic nerve: the nerve that carries sight messages to the brain

pa pil lae: tiny bumps that cover the tongue

pres sure: pressing down

pu pil: hole in the eye that light rays go through

re flex: quick action because of something you sense

ret in a: the back of the eyeball

sa li va: the liquid in the mouth

sen sa tion: a kind of feeling

sense or gans: parts of the body that get facts about the world; eyes, ears, nose, tongue, and skin

sen si tive: able to pick up light, sound, odor, touch, and taste

sight: the sense that tells us what things look like

smell: the sense that tells us what things smell like

sound waves: the way that sound travels

stim u late: make something act or work

taste: the sense that tells us if things are sweet, salty, sour, or bitter

taste buds: taste nerve cells

touch: the sense that tells us what things feel like

vi brates: moves back and forth quickly

vi bra tion: a very fast movement that goes back and forth



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